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Oromia orahan (Curculionidae, Molytinae), a new subterranean species for the Canarian underground biodiversity

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Abstract

A new blind weevil belonging to the genus *Oromia* Alonso-Zarazaga, 1987 is described, being found in the underground of the laurel forest of La Gomera (Canary Islands). Individuals were mainly collected in a colluvial mesocavernous shallow substratum, besides one specimen collected in the deep humic layer of soil. This new species has clear diagnostic differences from the other *Oromia* species. The number of taxa in this endemic Canarian genus increases to four species, easily identified using the key provided in this article. New data on other Canarian subterranean weevils are also provided.

Keywords

Canary Islands, Coleoptera, subterranean, identification key, MSS, new species, weevil

Introduction

The tribe Typoderini Voss, 1965 of the subfamily Molytinae Schoenherr, 1823 (Coleoptera: Curculionidae), is represented in the Canary Islands by three genera:

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Styphloderes Wollaston, 1873, *Oromia* Alonso-Zarazaga, 1987 and *Baezia* Alonso-Zarazaga & García, 1999 (Alonso-Zarazaga et al. 2017). *Styphloderes* is an epigean genus widely distributed in the Mediterranean and Macaronesian regions, while *Oromia* and *Baezia* are subterranean Canarian endemisms, these two latter genera being closely related (see comparative diagnosis in Alonso-Zarazaga and García 1999). *Baezia* is a more diverse genus occurring in lava tubes and the mesocavernous shallow substratum (henceforth referred as MSS; see Juberthie et al. 1980; Culver and Pipan 2010), although one species was found under stones in Tenerife (García et al. 2007).

The genus *Oromia* includes three species to date: *O. hephaestos* Alonso-Zarazaga, 1987 and *O. aguiari* Alonso-Zarazaga, 1990 both from Tenerife, and *O. thoracica* Machado & López, 2015 from Gran Canaria. These weevils are found in different underground environments: *O. hephaestos* in a few lava tube caves on the northern slopes of Tenerife (Alonso-Zarazaga 1987; Machado and López 2015), while *O. aguiari* and *O. thoracica* occur in the MSS (Alonso-Zarazaga 1990; Machado and López 2015), mainly consisting of colluvia covered by soil (Gilgado et al. 2011).

Oromia species are eyeless, with elongated and rather flattened bodies, slightly depigmented, all these being typical characters of weevils with a subterranean life style (Morrone and Hlaváč 2017). *Oromia* species are probably rhizophagous, they are usually found on or very close to roots hanging from the ceiling in lava tubes, and in the MSS they have always been collected in places with subsoil rich in roots (Machado and López 2015).

Several individuals of an unknown *Oromia* species were discovered in the laurel forest of the Canarian island of La Gomera, and the purpose of the present work is to provide its description.

Material and methods

Sampling and imaging

The first individual of this new species of *Oromia* was discovered while sifting soil under a dead laurel stump in La Gomera laurel forest, within Garajonay National Park. Thereafter, we started a systematic sampling of the MSS in another location of this forest using subterranean traps especially designed for this environment (López and Oromí 2010). Traps were revised each three months, being baited indistinctly with liver or blue cheese. After two years of continuous trapping, we captured several individuals of this new species.

After the study, the dirt deposited on the individuals was removed with a small paintbrush and warm water with dish-washing soap. For a comparative morphological analysis with respect to the other *Oromia* species, several specimens of *O. hephaestos*, *O. aguiari* and *O. thoracica* from the collections of the authors were used. Examination, dissection, measurements, and drawings were completed with the use of a Carl Zeiss Citoval 2 stereomicroscope with an ocular micrometer. Photographs were taken

under magnification using a CanonPowershot A650 attached to a Zeiss Stemi 2000 stereomicroscope and processed with the program Zerene Stacker (V. 1.04, Zerene Systems, LLC., Richland, WA), combining them into a single image using pmax and dmap methods.

Depositories

The material examined is deposited in the following collections:

HLH	Personal collection of Heriberto López Hernández, Canary Islands, Spain;
IPNA-CSIC	Invertebrates collection of the Instituto de Productos Naturales y Agrobiología (IPNA-CSIC), Tenerife, Canary Islands, Spain;
POM	Personal collection of Pedro Oromí, Canary Islands, Spain;
RGB	Personal collection of Rafael García Becerra, Canary Islands, Spain.

Results

Taxonomic acts
Class Insecta Linnaeus, 1758
Order Coleoptera Linnaeus, 1758
Superfamily Curculionoidea Latreille, 1802
Family Curculionidae Latreille, 1802
Subfamily Molytinae Schoenherr, 1823
Tribe Typoderini Voss, 1965
Genus *Oromia* Alonso-Zarazaga, 1987

***Oromia orahan* García & Oromí, sp. nov.**
http://zoobank.org/27FED0D7-F748-4427-8BDC-2B487C00F774
Figs 1–3

Type locality. Spain, Canary Islands, La Gomera: Reventón Oscuro, Garajonay National Park (28°7'27.08"N, 17°12'58.45"W, 1073 m a.s.l.).

Type material. ***Holotype*:** 1 ♂, La Gomera, Reventón Oscuro, Garajonay National Park (28°7'27.08"N, 17°12'58.45"W, 1073 m a.s.l.), MSS1/1, 3 January 2015, DNA771, P. Oromí leg. (IPNA-CSIC). ***Paratypes*:** same locality as the holotype, MSS2, 1♀, 5 February 2009, DNA688, P. Oromí leg. (IPNA-CSIC); MSS3, 1♀, 8 June 2010, DNA689, H. López & D. Hernández leg. (HLH); MSS1, 1♀, 7 January 2011, DNA690, P. Oromí leg. (POM); MSS2/4, 1♀, 16 November 2013, DNA572, P. Oromí leg. (POM); MSS1/3, 1♀, 3 January 2015, DNA770, P. Oromí leg. (POM). La Gomera, Hermigua, Monte de Los Acebiños, Garajonay National Park (28°08'20"N, 17°13'40"W, 1038 m a.s.l.), 1 ♂, 8 December 2008, R. García leg. (RGB).

Description. Male. Total length (including rostrum) 3.7–4.9 mm ($\bar{X}$= 4.3 mm). Maximal width 1.1–1.5 mm ($\bar{X}$= 1.3 mm). Body reddish-brown to yellowish-brown (Fig. 1), vestiture glabrous, with tiny setae (6–8 μm) on elytral interstriae, and on edges and keels of pronotum; setae longer and more visible on rostral apex, antennae and legs. Apterous.

Head globose, partially retracted into pronotum, carinated, with thick punctures, eyeless.

Rostrum (average length 1.1 mm) as long as pronotum and 4× as long as wide at apex. Rostrum dorsally parallel-sided, coarsely punctured and carinulated in basal half; apical half with a median keel and two pairs of lateral keels, all well-defined; each pair of lateral keels join at the end of metarostrum forming an elongated, narrow hexagon through mesorostrum, continuing from here as a single keel along prorostrum. Prorostrum smooth, punctured, with apical setae. In lateral view, metarostrum convex. Ventrally, rostrum with three carinae, median carina thin and weak, slightly defined or barely visible beyond the basal half, lateral carinae more robust.

Antennae with short bristles, inserted in apical third of rostral length. Scape smooth in the basal half, punctated and microreticulated surface in the apical half, 7.3× as long as its maximum width and 1.45× as long as funicule. First funicular antennomere obconical, 2.25× as long as wide; second obconical, 1.5× as long as wide, narrower than the first and half as long; funicular antennomeres 3 to 5 isodiametric, 5 to 7 slightly transverse. Club globose sub-rhombic, 2× as long as wide and as long as the last 5–6 funicular antennomeres.

Pronotum 1.1× as long as wide, anterior margin 0.66× as wide as posterior; with three strong keels from anterior to posterior margin, median one straight and two paramedian ones sinuous, and in addition two strong lateral keels; in dorsal view, these lateral keels form a sub-trapezoidal pronotum outline, rounded angles, widest at level of posterior third; margins between these angles variable, from straight to slightly sinuous. Surface mat, with well-defined punctation on keels and edges, microreticulate intervals and some microsetae on keels. Prosternum with three longitudinal keels that cut transverse prosternal furrow, leaving two well-defined foveae.

Scutellum not visible.

Pterothorax with elytra oblong, elongated, lacking humeral calli, almost parallel-sided with slight concavity towards middle; with microreticulate surface, punctation and pubescence similar to that on pronotum; 2.7× as long as pronotum and 1.78× as long as wide. Interstriae from barely defined to strongly costiform: odd interstriae strongly costiform, 7th forming marginal border without reaching apical callus; even interstriae barely defined, resulting in two rows of superficial punctures conforming striae between each interstria; 8th interstria not defined in the lateral declivity, 9th slightly careniform. Metasternum 3× as wide as long, with dense, deep, rugose punctation.

Abdomen with two first ventrites with shallower sparse punctation, disc of both depressed. Fifth ventrite with punctation similar to first two and 2.1× as wide as long.

Legs with dense coarse punctation, covered with setae. Procoxae separated by distance of 0.0125× of their diameter, 1.6× of distance from anterior margin of pronotum

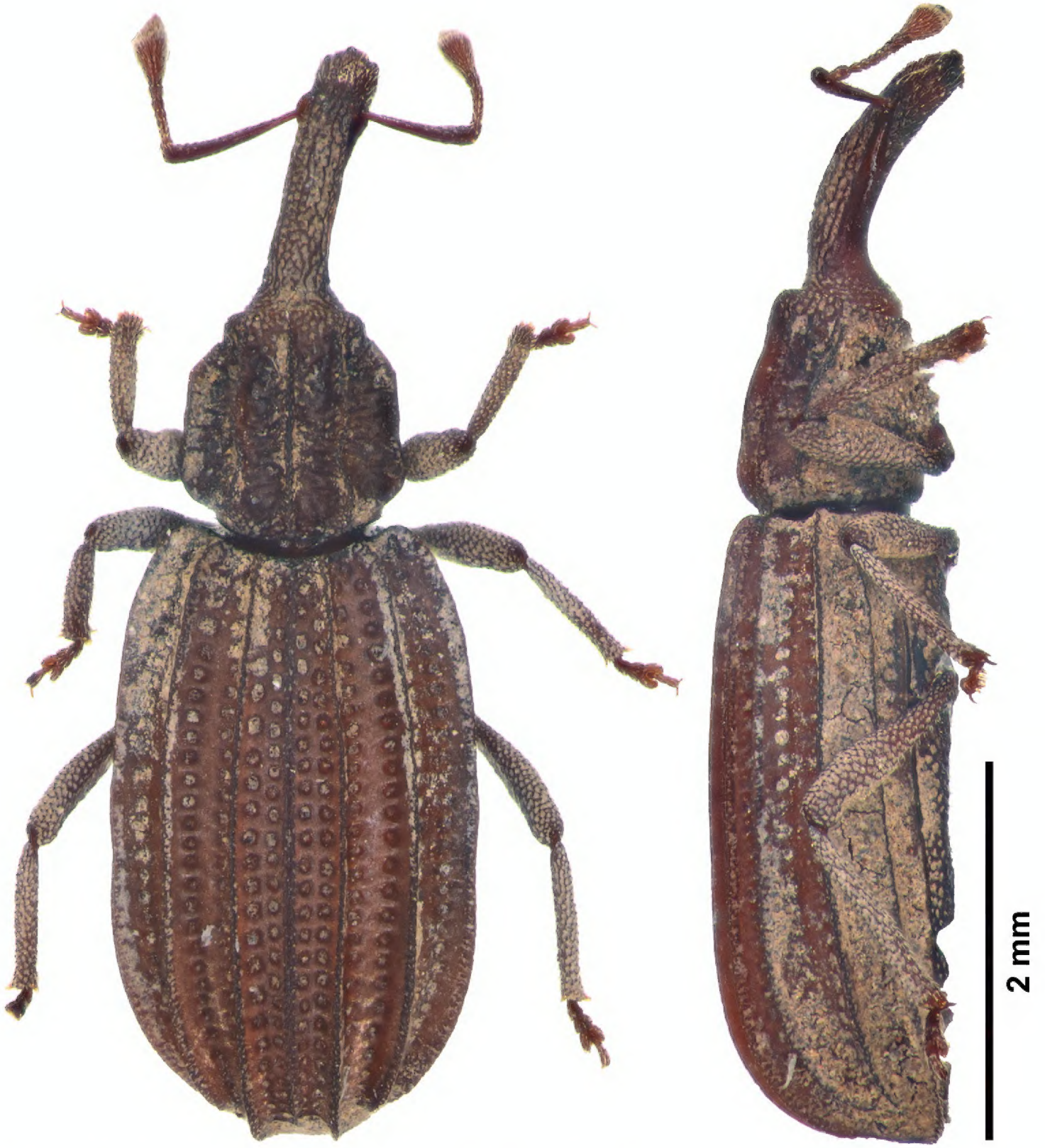

Figure 1. Habitus of *Oromia orahan* sp. nov. (female) in dorsal and lateral view.

and 1.5× of distance from posterior margin of pronotum. Mesocoxae separated by distance of 0.5× their diameter. Pro-, meso- and metafemora respectively 4.7×, 4.4× and 6× as long as their maximum width. Protibiae 5.8× as long as wide at apex (without counting uncus), almost straight, with external edge irregularly denticulate, and with dense strip of setae in a slight inner apical concavity. Meso- and metatibiae 5.4× and 6.9×, respectively, as long as their maximum width. First metatarsomere 1.36× as long as wide; second transverse, 0.66× as long as wide; third strongly bilobed, transverse, 0.87× as long as wide; onychium 3.6× as long as wide, 2/3 of its length projected from the third metatarsomere.

Aedeagus. Penis symmetric in dorsal view, parallel-sided and with the apex briefly pointed (Fig. 2A); dorsal plate strongly chitinised; clearly curved in lateral view, with acute apex and small callus; internal sac with densely arranged teeth in two longitudinal bands occupying the apical two thirds of tube. *Spiculum gastrale* robust and bowed with highly asymmetric arms (Fig. 2B). Tegmen with macrosetae, short manubrium and short, subparallel, blunt-tipped parameroid lobes (Fig. 2C).

Female. Similar to male, but with total length 5.2–5.5 mm ($\bar{X}$= 5.3 mm), maximal width 1.7–1.8 mm ($\bar{X}$ = 1.78 mm). Rostrum longer than in males (1.5 mm). Scape 9.6× longer than wide; 6th and 7th funicular antennomeres 1.25× longer than wide. Elytra 2.42× as long as pronotum, 1.56× longer than wide. 5th ventrite 2.6× as wide as long. Pro-, meso- and metafemora respectively 3.6×, 4.3× and 5.4× as long as wide. Pro-, meso- and metatibiae respectively 6.2×, 6.8× and 7.6× as long as wide.

Spiculum ventrale bilobed bearing about 16 macrosetae (Fig. 2D); manubrium with short median arm forking into two longer arms forming obtuse angle. Ovipositor with free conical apical styles, bearing 7–8 macrosetae (Fig. 2E).

Note. All collected individuals of *Oromia orahan* have the body total o partially covered by mud or dirt due to their subterranean life style, being often difficult to observe details of the tegument (scales, pores, keels, etc). The appearance of the individuals is very different when this dirt is removed (Fig. 3), a common feature in all Typoderini (Hlaváč, comm. pers.).

Differential diagnosis. *Oromia orahan* from La Gomera has outstanding morphological differences with respect to *O. hephaestos* from Tenerife and *O. thoracica* from Gran Canaria, regarding to size and shape of pronotum among other characters (see key to the species). However, *O. orahan* is close to *O. aguiari* from Tenerife, from which it differs by its longer and less curved rostrum, thicker scape, the shape of pronotum due the marginal keels (Fig. 4A), deeper general punctation, and the 8th interstria not marked in the lateral declivity.

Other differences related to the reproductive structures are: i) the aedeagus of *O. orahan* has parallel sides while in *O. aguiari* they are concave (Fig. 4B); ii) the manubrium of the *spiculum ventrale* of *O. orahan* has a short arm forking into two longer arms forming an obtuse angle, while in *O. aguiari* the manubrium is divided into two arms arising directly from the plate of the *spiculum ventrale* forming an acute angle (Fig. 4C); iii) the tegmen of *O. aguiari* has subtriangular parameroid lobes whereas in *O. orahan* the lobes are subparallel, short and with blunt tips (Fig. 4D).

Etymology. Specific name in apposition of Orahan, who was considered as the supreme god, creator of everything, by the aboriginal people of La Gomera.

Habitat and distribution. The known distribution of *Oromia orahan* sp. nov. is restricted to Garajonay National Park, a protected area of approximately 40 km^2 located on the central mountainous region of La Gomera. This National Park includes one of the best representations of laurel forest in the Canary Islands. This type of vegetation was thought to be a relict flora from South Europe and North Africa, extinct during the Tertiary period due to the effects of glaciations and the desertification in these areas (Cronk 1992; Médail and Quézel 1999; Nakamura et al. 2000), although this has been

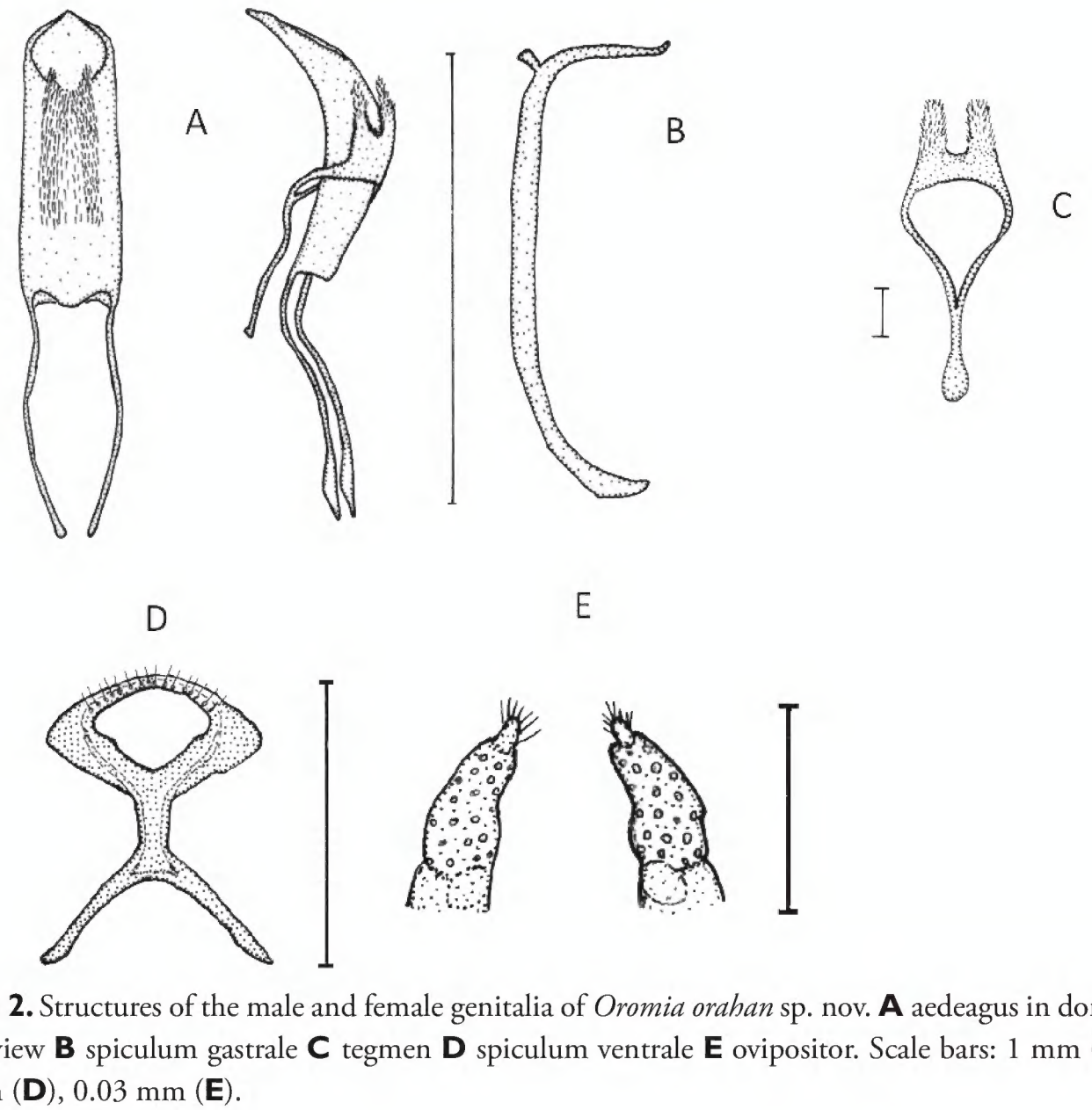

Figure 2. Structures of the male and female genitalia of *Oromia orahan* sp. nov. **A** aedeagus in dorsal and lateral view **B** spiculum gastrale **C** tegmen **D** spiculum ventrale **E** ovipositor. Scale bars: 1 mm (**A–C**), 0.8 mm (**D**), 0.03 mm (**E**).

recently questioned (Kondraskov et al. 2015). The laurel forest is a humid wood, in which approximately 15 broad-leaved, evergreen tree species from 10 different families form the canopy (e.g. genera *Laurus*, *Ilex*, *Persea*, *Picconia*). This forest constitutes the ecosystem with the highest levels of arthropod diversity within Macaronesia (Fernández-Palacios et al. 2017). Consequently, it is an interesting habitat for the exploration of the subterranean biodiversity. For this reason, we selected two localities in the Garajonay National Park to study the subterranean fauna using two different methods.

In Monte de Los Acebiños we sifted leaf litter and soil under the stump of a dead laurel, and at other sites we washed soil following the first steps of the technique described by Arribas et al. (2016). Besides one individual of *O. orahan* sp. nov. collected with the first method, in this locality we found other interesting subterranean coleopteran species such as the weevils *Laparocerus oromii* Machado, 2008 and *Torneuma aphroditae* (Germann & Stüben, 2006), and the ground beetle *Lymnastis gaudini gomerae* Franz, 1965.

In Reventón Oscuro we installed four subterranean traps following López and Oromí (2010) in the MSS on a steep slope originated by colluviation at the base of rocky cliffs, but probably also increased by more recent stony debris slipping downslope

Figure 3. Appearance of mud/dirt covered (**A**) and clean (**B**) individuals of *Oromia orahan* sp. nov.

during the construction of an old forest road. To install the traps, places with 100% canopy cover were selected, which render a permanent penumbra to the surface and humidity to the underground layer. This locality was especially rich in subterranean

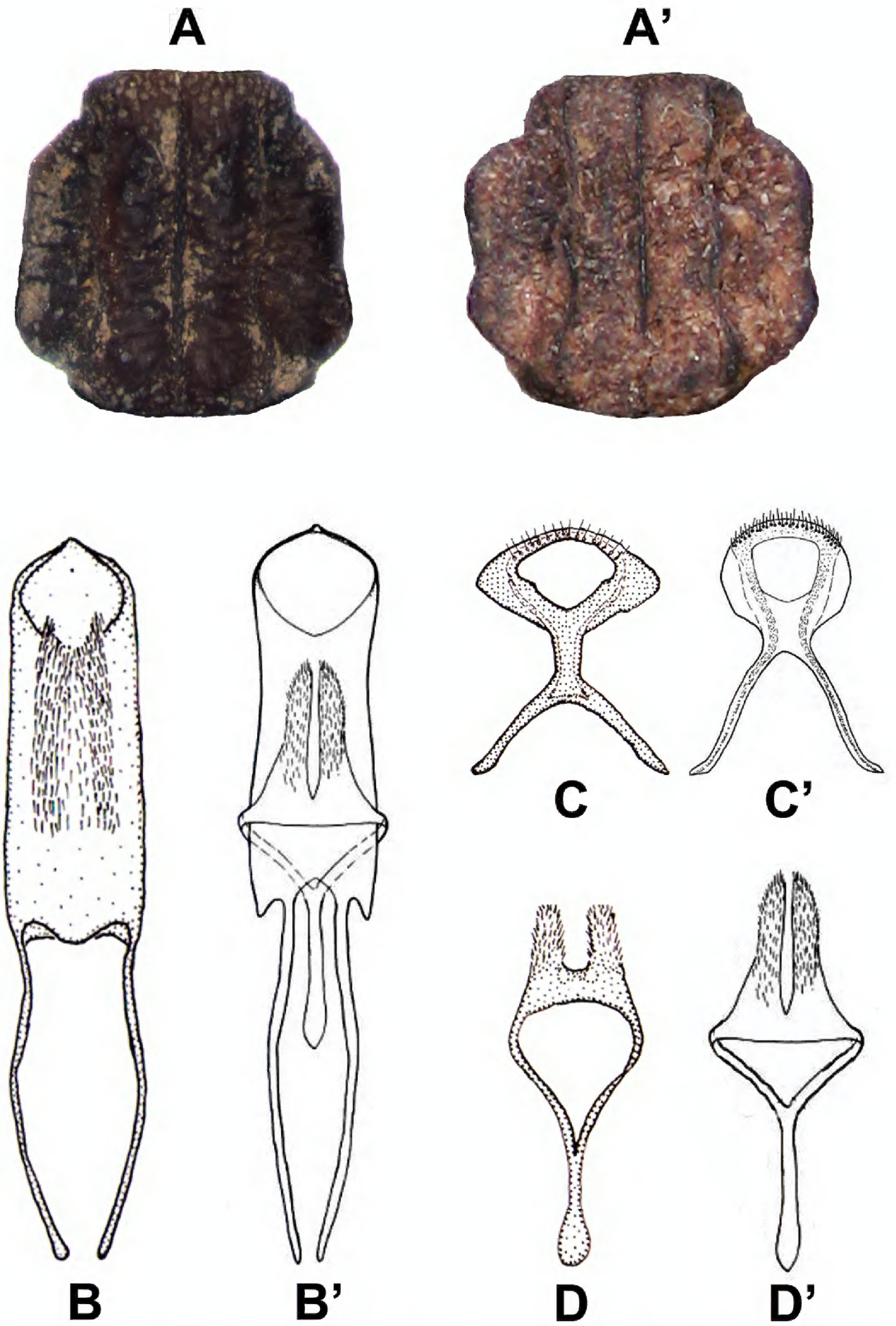

Figure 4. Structures of *Oromia orahan* sp. nov. (letters without asterisks) and *O. aguiari* (letters with asterisks) **A** pronotum **B** aedeagus **C** *spiculum ventrale* **D** tegmen.

species, in which we collected the ground beetles *Pseudoplatyderus amblyops* Bolívar, 1940 and *Lymnastis gaudini gomerae*, the rove beetles *Domene jonayi* Hernández & Medina, 1990 and *Micranops subterraneus* Frisch & Oromí, 2006, the histerid beetle *Aeletes gemmula* (Wollaston, 1865), the scydmaenid *Euconnus specusus* Vit, 2004, the

weevils *Laparocerus oromii* and *Torneuma orbatum* Wollaston, 1865, an undescribed woodlouse of the genus *Venezillo*, and the millipedes *Glomeris canariensis* Golovatch, 1987 and *Thalassisobates emesesensis* Enghoff, 2013.

All populations of *Oromia orahan* sp. nov. are located inside a natural protected area, well preserved, at least at the epigean level. So we can assume that this species is under no threat at the moment. However, in recent years we have detected an alarming correlation between the increase of the non-native polydesmid millipede *Brachydesmus* sp. in the subterranean habitats of the National Park and a considerable decrease in captures of native endogean invertebrates in subterranean traps. Specific studies on the effect of this polydesmid on the subterranean communities are necessary, to establish the real conservation status of this new species.

Key to the species of *Oromia*

1 Pronotum not constricted anteriorly and expanded over the head; ventral margin of antennal scrobe reaching middle of rostrum; metapleurosternal sulcus absent (Gran Canaria) ..... ***O. thoracica* Machado & López**

– Pronotum constricted anteriorly and not expanded over the head; ventral margin of antennal scrobe reaching base of rostrum; metapleurosternal sulcus present **2**

2 Pronotum clearly longer than wide, median, paramedian and marginal-lateral keels absent; prosternum without keels; elytra large and elliptic, with all interstriae costiform, profile serrated (Tenerife)... ***O. hephaestos* Alonso-Zarazaga**

Pronotum almost as long as wide, with strong median, paramedian and marginal-lateral keels; prosternum with three longitudinal keels; elytra large and oblong, odd interstriae strongly costiform and even interstriae barely marked, profile not serrated **3**

3 Lateral keels of pronotum bilobed, with a marked medial cutout, forming in dorsal view a bilobed outline; pronotum widest at the level of the apical lateral lobe or at the level of both lateral lobes; 8th interstria marked in the lateral declivity (Tenerife) ..... ***O. aguiari* Alonso-Zarazaga**

– Lateral keels of pronotum not bilobed, without marked medial cutout, forming in dorsal view a sub-trapezoidal outline; pronotum widest at level of posterior third; 8th interstria not marked in the lateral declivity (La Gomera) ..... ***O. orahan* sp. nov.**

New data on Canarian subterranean weevils

Besides the discovery of new species like *Oromia orahan*, the active searching of the fauna in the different subterranean habitats of the Canary Islands, especially in the subsurface layers, is providing new distributional data for some poorly known spe-

cies which are worth to be recorded. The databases of biodiversity are very useful for a research, management, education and communication (Borges et al. 2010), so the publication of new data about the precise distribution of the species is of great importance to increase and update the information of these databases. Given the difficulty of studying the subterranean fauna, these databases usually have little information about underground species, so it is especially necessary the recording of such data. In this way, the management of the territory carried out by the governments using these databases will take into account the underground species, a type of fauna especially sensitive to the transformation of the habitats.

Subfamily Cossoninae Schoenherr, 1825

Barretonus auarita García & Oromí, 2019

New record. La Palma island. Barlovento, Punta Salvaje (28°49'25.34"N, 17°46'17.29"W, 124 m a.s.l.), 2 exx., 18 October 2019, sieving deep leaf litter under *Euphorbia balsamifera*, R. García leg. (RGB).

The Macaronesian endemic genus *Barretonus* Roudier, 1958 includes four species from Madeira and two from the Canary Islands. In the recent description of the last species (García et al. 2019), *B. daute* from Tenerife was considered to have a few omatidia, but this is a wrong statement that has to be amended in that description as well as in Table 2. Actually, all species of *Barretonus* are eyeless, since also the statement by Folwaczny (1972) that *B. minor* Folwaczny, 1972 and *B. major* Folwaczny, 1972 had also highly reduced eyes was wrong, which has been confirmed after the revision of the types by Peter Stüben (pers. comm.). Recently, we have collected some individuals of *B. auarita* on a new locality situated between other two already known, which indicates that this species must be well distributed along the eastern and northern coast of the island.

Subfamily Entiminae Schoenherr, 1823

Laparocerus oromii Machado, 2008

New record. La Gomera. El Cedro, Garajonay National Park (28°7'25.03"N, 17°13'26.88"W, 966 m a.s.l.; new grid (500×500 m) for El Cedro in the Biodiversity Data Bank of the Canary Islands (BDBC)), 2 exx, 17 March 2017, GEEI (Grupo de Ecología y Evolución en Islas) leg. (IPNA-CSIC); Teselinde (28°11'46.35"N, 17°17'15.55"W, 744 m a.s.l.), 2 exx, 18 March 2017, GEEI leg. (IPNA-CSIC).

The speciose genus *Laparocerus* includes one species from South Morocco and 221 taxa endemic either to Madeira or the Canary Islands (Machado, 2018), several of them having adapted to the different habitats of the underground as lava tubes, the

MSS and the soil (Machado 2018). The prospection of MSS and soil in La Gomera has provided new locations for *L. oromii* on this island, one of them being the first location reported for this species outside Garajonay National Park.

Laparocerus dacilae García, 1998

New record. La Palma. Mazo, Lomo Oscuro (28°34'51.83"N, 17°46'53.59"W, 536 m a.s.l.), 1 ex, 11 January 2015; 1 ex. 17 January 2017, R. García leg. (RGB).

This other species of subterranean *Laparocerus* is endemic to the southern half of La Palma island, where it has always been collected in caves. We provide a new locality in which some specimens have been collected under big stones.

Subfamily Molytinae Schoenherr, 1823

Baezia vulcania Alonso Zarazaga & García, 2002

New record. La Palma. El Paso, Cueva de la Torreta Tacande (28°38'21.87"N, 17°52'47.92"W, 677 m a.s.l.), 14 May 2019, eclosion from roots, R. García leg. (RGB).

This small, apparently edaphobiont species is only known from lava tubes of the southern half of La Palma. The cave where it has been recently found enlarges its distribution towards northwest, close to the limit of the geologically older northern half of the island.

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